

### **REMARKS**

Applicant traverses the rejections of claims 1-21 under 35 USC 112; claims 1-3, 6-9 and 19 rejected under 35 USC 102(b) as being anticipated by the Adell U.S. Patent Number 5,237,306; claims 10, 11 and 13 rejected under 35 USC 102(b) as being anticipated by Udofot U.S. Patent Number 5,005,004; claims 4 and 5 rejected under 35 USC 103(a) as being obvious under Adell '306 in view of Reppas et al. U.S. Patent Number 5,598,164; claim 12 rejected under 35 USC 103(a) as obvious in view of Udofot '004 and Reppas '164; and claims 14 and 15 rejected under 35 USC 103(a) as obvious in view of Udofot '004 when combined with Reppas et al. '164 and Adell '306.

### **Drawing Objections**

The Examiner has objected to Figures 1 and 2 currently in the application in that element 16 and 30 are hard to see, and the lead line for element 19 gets lost in the shading. The amended Figures 1 and 2 are submitted to address the Examiner's objections. In the revised Figures, the shading has been reduced or eliminated so as to provide better visibility of the various elements and lead lines.

The Examiner has argued that Figure 2 is an unnecessary duplicate of Figure 4 as they contain the same reference numerals. Both figures should be retained in the application as together they serve to better illustrate the invention. The Examiner has also argued that Figure 3 does not add anything to aid in the understanding of the invention. On the contrary, Figure 3 shows a different perspective of the present invention to better illustrate one possible location for the present invention.

### **Specification Objections**

The Examiner has objected to the Specification in that Page 1 is missing. Page 1 of the application was corrected under Rule 26 of the PCT on July 29, 1999 at the request of the Canadian

Receiving Office. The correction related to amending the title to correspond with the title appearing in Box 1 of the Request.

The Examiner has objected that element 18 has been referred to as “a wire” and “a connection”. The paragraph beginning at page 7, line 7 of the current application, has been amended to address this objection by describing the connection as being made “by way of electrically conductive wire 18”.

### **Claims Objections**

#### ***Dependencies***

It appears that the Examiner’s initial confusion regarding the claims stems from the fact that she has examined the claims as originally filed under the PCT on June 30, 1999, and not the claims currently in the application as amended by the applicant on July 21, 2000 during International Preliminary Examination, in response to the Written Opinion.

Included herewith is a copy of the IPER, which includes copies of the amended description and claims as published with the IPER. For clarity, the claims and description will be referred to as originally filed under the PCT on June 30, 1999 as the original claims and description, and the claims and description as amended during International Preliminary Examination as the current claims and description.

The Preliminary Amendment of December 29, 2000 ought to have been applied to the current claims as amended under the PCT and published with the IPER.

#### ***Cooperative***

The Examiner has objected to Claims 1 to 21 on the basis that she is unsure how to interpret the word “*cooperative*”. The word “cooperative” is used to describe the behaviour of vehicle drivers

who use the present invention to warn drivers of oncoming vehicles of unexpected, upcoming road hazards. The act of using the present invention to issue a warning can be seen as a cooperative act between two drivers. To make this more apparent to the reader, the paragraph commencing on page 1, line 26 of the current application has been amended and a new paragraph has been added after the paragraph commencing on page 2, line 20 and before the title "SUMMARY OF THE INVENTION" commencing on page 3, line 1.

The applicant has not added any new subject matter to the application that could not be inferred from that originally filed, but has merely attempted to clarify the meaning of the term "cooperative."

### **Claims Rejections**

#### ***Proportional***

The Examiner has rejected claims 4, 5 and 16 to 21 as being indefinite and has expressed uncertainty as to how the frequency of on and off flashes is varied over time to yield an inverse proportional relationship between the frequency of flashes and the time interval since activation.

In a proportional relationship between two variables such as time and frequency, as one variable increases or decreases from a fixed point, the other variable will also increase or decrease by a proportional amount from a predetermined fixed point. Hence the term "proportional." In an inverse proportional relationship, the interaction between the two variables is inverted. That is, as one variable increases, the other variable will decrease by a proportional amount or vice versa. Thus, in the present invention, as described in the paragraph commencing on page 6, line 14 of the description, as the time since activation of the lamp increases, the frequency of the on and off flashes of the lamp decreases. Hence, there is an inverse proportional relationship between the frequency of

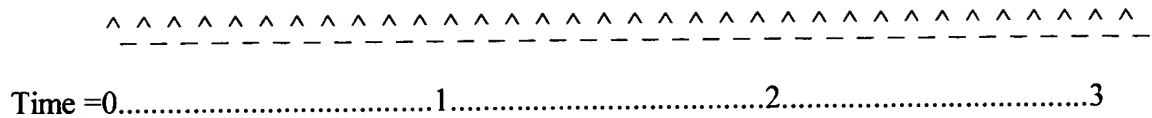
the lamp flashes and the time interval since activation. This relationship is determined by timing and flashing circuits contained within the electronic control unit of the invention. Those skilled in the art will readily appreciate how such an inverse proportional relationship can be generated.

### *Frequency*

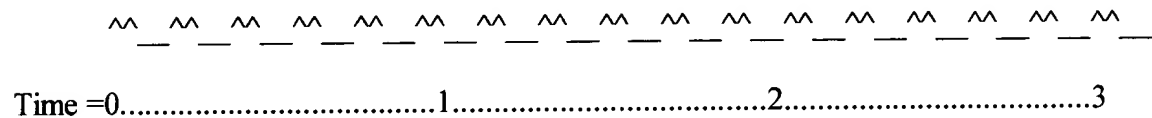
The Examiner has expressed uncertainty as to whether the applicant is claiming frequency in hertz or the fact or condition occurring frequently. The applicant believes that it is clear at all times from the context of the specification as a whole that the term “frequency” is being used to refer to the number of times that the lamp flashes on and off over a given period of time, that is *hertz* or cycles per second. Referring to the definition supplied by the Examiner, the term “frequency” as used by the applicant refers to *“the number of times that a periodic function repeats the same sequence of values during a unit variation of the independent variable.”*

The frequency can either be relatively high or low, or relatively rapid or slow. The actual frequency is unimportant, only the relative change in frequency between the initial activation of the lamp and some time after the lamp has been activated is significant. The purpose of the change in frequency of the on and off flashes over time is to communicate information to the driver of an oncoming vehicle as to the location of a road hazard. Relatively rapid on off flashes of the lamp (high frequency) will signal a relatively close hazard, while relatively slow on off flashed of the lamp (lower frequency) will signal a more distant hazard.

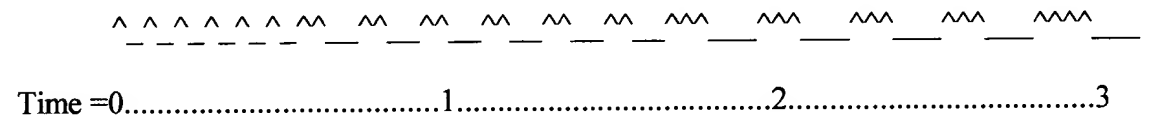
For greater clarity, assume that the symbol “^” represents the lamp turning on for a fixed period of time, and the symbol “\_” represents the lamp turning off for the same fixed period of time. Then, the following sequence would represent a lamp flashing at a relatively high frequency of about 12 cycles per second:



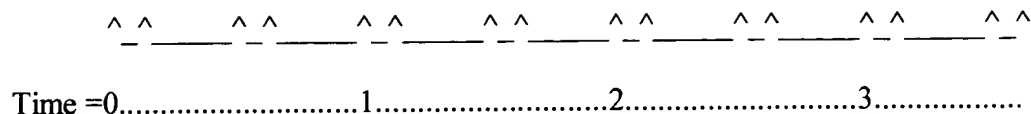
and the following sequence would represent a lamp flashing at one half the frequency of the lamp above, or a relatively lower frequency of about 6 cycles per second:



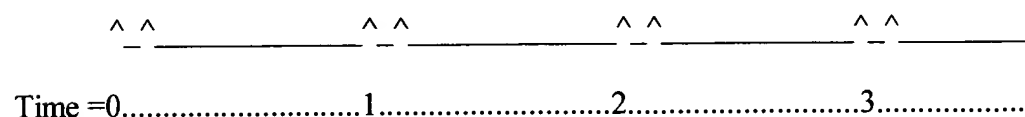
In one example on page 6, commencing at line 17, lamp **15** is described as flashing on and off for a predetermined amount of time to provide a visible warning signal. In the next example, commencing at page 6, line 19, the “*frequency*” of the on and off flashes is reduced over time (that is, the frequency of flashes varies inversely proportional to the time). The lamp flashes rapidly when it is first activated, and then the frequency of on off flashes is decreased. This can be illustrated by the following example:



Cadence is different from frequency and is used to refer to a beat or pattern of flashes. For example, a cadence can be comprised of two rapid on and off flashes followed by a longer period when the lamp is off. Frequency can then be used to describe the periodic repetition of the cadence pattern. For example, the following is a cadence repeating with a frequency of two patterns per second :



If the time interval between the two rapid on and off flashes increases, then the frequency of the repetition of the cadence pattern decreases. For example, the following is the same cadence as above, but repeating at a lower frequency of one cycle per second.:



It is therefore submitted that the term “*frequency*”, occurring throughout the application, refers to cycles per second and that no amendment to the application or claims is warranted or necessary.

### ***High Frequency***

The examiner has asked for an explanation of high frequency as used in original claims 16 to 21 of the present application. Those skilled in the art of designing devices similar to the present invention will readily appreciate what is meant by high frequency when referring to a flashing light designed to be viewed by the human eye.

For example, all incandescent light bulbs operating on normal household alternating electric current (AC) in North America flash on and off at a frequency of 60 cycles per second (hertz). This frequency of on and off flashes is not perceptible to the human eye. Therefore the light appears as if it is constantly on. Accordingly, those skilled in the art will appreciate that the term “high frequency”, when considered in light of the present application, is somewhat below 60 herts. In fact,

human perception is unable to distinguish individual flashes of light from a lamp flickering at greater than 20 cycles per second. For example, in a motion picture, the individual frames of the film are presented at a rate of 24 frames per second, standard television is 30 frames per second, with a short blank period between each frame. Normal human perception is unable to distinguish the individual frames and thus blends them all together to create the illusion of motion. This is why motion pictures presented at less than 24 frames per second, may seem jerky or may appear to flicker.

Once the on-off flash frequency drops below about 10-15 cycles per second, the human eye will begin to perceive the individual on and off flashes. Therefore, one skilled in the art of designing flashing lights for perception by the human eye will understand the meaning of high frequency. A high frequency flashing light will be one that is flashing on and off close to the limits of human perception, but yet where the individual on and off states of the lamp can still be observed.

### ***Means***

The Examiner has objected that the word “means” in original claims 16, 17, 20 and 21 is not preceded by a function so as to enable the Examiner to determine the equivalents of the element. The Examiner will appreciate that the claims currently in the application, as amended during International Preliminary Examination under the PCT, no longer include such undefined means clauses. The applicant therefore believes the Examiner’s objection on this point is now moot.

### **Claims Rejection Based on Adell**

The Examiner has objected to original claims 1-3, 6-9 and 19 as being anticipated by U.S. Patent No. 5,237,306 to Adell. The Examiner has indicated that original claims 4 and 5 would be allowable over Adell when considered alone, since Adell does not teach that the predetermined frequency varies depending on the length of time the lamp has been activated or that the

predetermined frequency is inversely proportional to the length of time the lamp has been activated.

Accordingly, the amendments made to claim 1 during International Preliminary Examination, and the amendments included herein, which incorporate the elements of claims 3 and 4 into original claim 1, so as to now describe the predetermined frequency as being variable in proportion to the length of time the lamp has been activated, clearly and patentably distinguish over Adell when considered alone. (See marked attachment of original claim).

In that claims 2 to 7 and 12 to 22 currently in the application all depend directly or indirectly from claim 1, they too are submitted to be patentable over Adell when considered alone.

#### **Objections to Original Claims 10 to 15**

The Examiners objections to original claims 10 to 15 based on U.S. Patent No. 5,005,004 to Udofot, alone or in combination with U.S. Patent No. 5,598,164 to Reppas et al. and/or in view of Adell are moot in light of the fact that original claims 10 to 15, which correspond to claims 8 to 11 currently in the application, have been deleted by the applicant.

#### **Claims Rejection Based on Adell and Reppas**

The Examiner has objected to original claims 4 and 5 as being obvious based on a combination of Adell and Reppas et al. This objection is now applicable to claims 1 and 3 currently in the application as amended. According to the Examiner, Adell teaches the claimed invention except that the predetermined frequency varies depending on the length of time the lamp has been activated and that the predetermined frequency is inversely proportional to the length of time the lamp has been activated. In the Examiner's view, these features can be found in the teaching of Reppas et al. at col. 6, lines 54-67 and col. 7, lines 1-12, and therefore the combination of Adell and Reppas et al. results in the present invention, as claimed, being obvious. The applicant disagrees for the following reasons.

Claim 1 of the present application, as herein amended, is now believed to clearly define the applicant's invention over the prior art cited. Claim 1, as amended, describes a cooperative advance warning system having a lamp **15** mounted on the vehicle, a switch **19** for activating and deactivating the lamp, and an electronic control unit **13** to control the characteristics of the light emitted by the lamp, the electronic control unit being capable of causing the lamp to flash on and off at a pre-determined frequency, and the pre-determined frequency being variable in proportion to the length of time the lamp has been activated. As thus claimed, the present invention, is believed to clearly and patentably distinguish over the combination of Adell and Reppas et al.

In particular, Reppas teaches a vehicle obstacle avoidance system that detects obstacles to the front, rear and sides of the vehicle, warns the driver, and prevents the vehicle from moving if the vehicle is stopped. In the particular passage referred to by the Examiner, the warning flashes given by the device vary depending on the proximity of the object to the vehicle, not the length of time the device has been activated, as suggested by the Examiner. For example, as described by Reppas, for objects that are close, the pictogram could flash rapidly, and for farther objects the flashing could be less (see col. 7, lines 7-10).

In contrast to the present invention, as described in claim 1 as herein amended, Reppas does not cause the pictogram to flash on and off at a frequency that is in proportion to the length of time the lamp has been on. Instead, Reppas varies the flash rate of the pictogram based on the distance to the obstacle as measured by the detection means.

In the result, similar information might be conveyed by the applicant's invention and the device of Reppas, that is, the distance to the obstacle or hazard, but the method by which the information is generated and conveyed by the applicant's invention is completely different from that

described by Reppas. There is no teaching by Reppas of varying the frequency of the lamp in proportion to the length of time the lamp has been activated.

In Reppas, the distance to the obstacle is measured by the detection means and the pictogram flash frequency is selected to correspond to that distance. In the present invention, the flash frequency of the lamp is varied depending only on the length of time the lamp has been activated. In order to determine the actual relative distance to the upcoming road hazard, it is necessary for the driver of an oncoming vehicle to observe the frequency of the flashing lamp of the present invention and estimate the speed of the vehicle. A rapidly flashing lamp and a slow moving vehicle will indicate a relatively close obstacle. But, a rapidly flashing lamp combined with a fast moving vehicle will signal an obstacle that is somewhat farther off.

The advantage of the present invention, when compared to the combination of Adell and Reppas is that it is not necessary for the present invention to actually measure the distance to the obstacle to determine and select the frequency of the flashing lamp. In the present invention, the frequency is varied automatically depending on the length of time the lamp has been activated, thus conveying distance information to the oncoming driver without actually having to make a distance measurement. Thus, the present invention can be useful in warning of the distance to road hazards such as fog, black ice, smoke, floods, and holes or wash-outs in the road, whereas it would be difficult, if not impossible, for a device constructed in accordance with the teachings of Adell and Reppas to detect or measure the distance to such obstacles. Moreover, since it is necessary for Reppas to actually detect and measure the distance to the obstacle, such a device could not continue to warn of the distance to the hazard once the hazard disappeared around a corner or over a hill.

Accordingly, claim 1 currently in the application as herein amended is believed to patentably

distinguish over Adell in combination with Reppas et al., and the applicant requests that the examiner withdraw her objections based thereon. In that claims 2 to 7 and 12 to 17 depend directly or indirectly from claim 1, they too are believed to be allowable over these references as well.

#### New Claims

New claims 18 to 22 have been added to the application. These claims are similar to current claims 13, 14, 15 and 17, and merely include a different combination of dependencies. Since claims 18 to 22 depend directly or indirectly from claim 1, they are submitted to be patentable over the cited references for the same reasons expressed above.

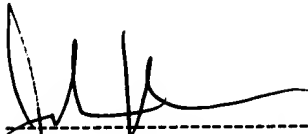
The applicant has also amended the application to add new claims 23 to 27, which describe a method of warning drivers of an upcoming, unexpected road hazard (30), comprising the steps of selecting a plurality of locations, each location being located a selected respective distance from the road hazard, placing at each location a portable cooperative advance warning system comprising a lamp for emitting a light beam that is visible to the drivers of vehicles, and causing each of the lamps to flash on and off at a respective frequency that is in proportion to the selected respective distance of the lamp from the road hazard. None of the references cited by the Examiner disclose or even suggest the combination of steps disclosed in the method of new claims 23 to 27.

A one month extension of time together with fee has been filed with this amendment. If there are any additional fees incurred please charge deposit account 07-1340.

It is respectfully requested that the arguments and amendments present in the present application in condition for favorable reexamination and that the application be passed to issue.

Respectfully submitted,

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## **VERSION OF SPECIFICATION WITH MARKINGS TO SHOW CHANGES MADE**

Currently, however, even where drivers negotiate such circumstances and are therefore aware of the unusual danger or condition lying ahead of the oncoming traffic, and wish to cooperate with [warn] oncoming drivers to warn them of the danger, there is no established or accepted, safe and reliable method or device to allow them to communicate an advance warning to approaching vehicles.

What is needed, then, is a means for vehicle drivers to cooperate with drivers of oncoming vehicles, to warn them of an upcoming, unexpected road hazard, and to preferably provide those drivers with some information as to the location of such hazard.

Referring to Figure 6, in yet another preferred embodiment of the present invention there is provided a connection, by way of electrically conductive wire 18, between electronic control unit 13 and the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21 of the vehicle, and/or a separate rear-facing warning light 22. Upon activation of the system, the centre high-mounted brake light 14 and/or rear tail-mounted brake lights 21 of the vehicle, and/or the separate rear-facing warning light 22, are caused to flash rapidly on and off in conjunction with lamp 15 for a brief period of perhaps 10 seconds. This acts as an immediate warning to any vehicle travelling behind vehicle 12 to be on the lookout for a road hazard.

**VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE  
AND ADDED CLAIMS**

Claim1. (Amended) A cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising:

a lamp mounted on the vehicle in a location where light emitted by said lamp is visible to drivers of the oncoming vehicles;

a switch means connected to said lamp for activating and deactivating said lamp, said switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and

an electronic control means connected to said lamp for controlling the characteristics of the light emitted by said lamp, said electronic control means being capable of causing said lamp to flash on and off at a pre-determined frequency, said predetermined frequency being variable in proportion to [depending on] the length of time said lamp has been activated.

**Added New Claims:**

18. (New) A cooperative advance warning system according to claim 12, further comprising:

a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing warning light,

said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system.

19. (New) A cooperative advance warning system according to claim 13, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

20. (New) A cooperative advance warning system according to claim 18, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

21. (New) A cooperative advance warning system according to claim 18, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

22. (New) A cooperative advance warning system according to claim 16, further comprising:

a rear-facing warning light mounted on the rear of the vehicle; and  
a connection between said electronic control means and said rear-facing warning light,  
said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

23. (New) A method of warning drivers of vehicles of an upcoming, unexpected road hazard comprising:

selecting a plurality of locations, each said location being located a selected respective distance from the road hazard;

locating at each said location a portable cooperative advance warning system comprising a lamp for emitting a light beam that is visible to the drivers of said vehicles; and

causing each of said lamps to flash on and off at a respective frequency that is in proportion to said selected respective distance of said lamp from the road hazard.

24. (New) A method according to claim 18, wherein said respective frequency comprises a cadence.

25. (New) A method according to claim 18, wherein said locations are positioned generally in the same direction from the road hazard.

26. (New) A method according to claim 18, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

27. (New) A method according to claim 18, wherein said respective frequency is inversely proportional to said selected respective distance of said lamp from the road hazard.

#### MARKED UP VERSION OF ORIGINAL CLAIM 1

1. A cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising:

a lamp mounted on the vehicle in a location where light emitted by [the] said lamp is visible to drivers of the oncoming vehicles;

a switch means connected to [the] said lamp for activating and deactivating [the] said lamp, [the] said switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and

an electronic control means connected to said lamp for controlling the characteristics of the light emitted by [the] said lamp, said electronic control means being capable of causing said lamp to flash on and off at a pre-determined frequency, said predetermined frequency being variable in proportion to the length of time said lamp has been activated.

CLEAN SET OF ALL PENDING CLAIMS

1. A cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising:

a lamp mounted on the vehicle in a location where light emitted by said lamp is visible to drivers of the oncoming vehicles;

a switch means connected to said lamp for activating and deactivating said lamp, said switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and

an electronic control means connected to said lamp for controlling the characteristics of the light emitted by said lamp, said electronic control means being capable of causing said lamp to flash on and off at a pre-determined frequency, said predetermined frequency being variable in proportion to the length of time said lamp has been activated.

2. A cooperative advance warning system according to claim 1, wherein said electronic control means comprises means to automatically deactivate said lamp after a pre-determined period of time following activation.

3. A cooperative advance warning system according to claim 1, wherein said pre-determined frequency is inversely proportional to the length of time said lamp has been activated.

4. A cooperative advance warning system according to claim 1, wherein said pre-determined frequency comprises a cadence.

5. A cooperative advance warning system according to claim 1, wherein said electronic control means further comprises means to maintain said pre-determined frequency or cadence at a particular value for an indefinite period.

6. A cooperative advance warning system according to claim 1, further comprising an

in-use indicator light connected to said switch means and to said electronic control means for indicating to the driver of the vehicle when the cooperative advance warning system is operating.

7. A cooperative advance warning system according to claim 1, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

12. A cooperative advance warning system according to claim 1, for use on a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle brake lights,  
said electronic control means being capable of causing the vehicle brake lights to flash on and off at a high frequency upon activation of the advance warning system.

13. A cooperative advance warning system according to claim 1, further comprising:  
a rear-facing warning light mounted on the rear of the vehicle; and  
a connection between said electronic control means and said rear-facing warning light,  
said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system.

14. A cooperative advance warning system according to claim 12, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

15. A cooperative advance warning system according to claim 13, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

16. A cooperative advance warning system according to claim 1, for use on a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle brake lights,  
said electronic control means being capable of causing the vehicle brake lights and said lamp to flash on and off at a high frequency upon activation of the advance warning system,  
said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp and the vehicle brake lights.

17. A cooperative advance warning system according to claim 1, further comprising:  
a rear-facing warning light mounted on the rear of the vehicle; and  
a connection between said electronic control means and said rear-facing warning light,  
said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,  
said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

18. A cooperative advance warning system according to claim 12, further comprising:  
a rear-facing warning light mounted on the rear of the vehicle; and  
a connection between said electronic control means and said rear-facing warning light,  
said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system.

19. A cooperative advance warning system according to claim 13, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

20. A cooperative advance warning system according to claim 18, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation

of the advance warning system.

21. A cooperative advance warning system according to claim 18, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

22. A cooperative advance warning system according to claim 16, further comprising:  
a rear-facing warning light mounted on the rear of the vehicle; and  
a connection between said electronic control means and said rear-facing warning light,  
said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,  
said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

23. A method of warning drivers of vehicles of an upcoming, unexpected road hazard comprising:

selecting a plurality of locations, each said location being located a selected respective distance from the road hazard;

locating at each said location a portable cooperative advance warning system comprising a lamp for emitting a light beam that is visible to the drivers of said vehicles; and

causing each of said lamps to flash on and off at a respective frequency that is in proportion to said selected respective distance of said lamp from the road hazard.

24. A method according to claim 18, wherein said respective frequency comprises a cadence.

25. A method according to claim 18, wherein said locations are positioned generally in

the same direction from the road hazard.

26. A method according to claim 18, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

27. A method according to claim 18, wherein said respective frequency is inversely proportional to said selected respective distance of said lamp from the road hazard.

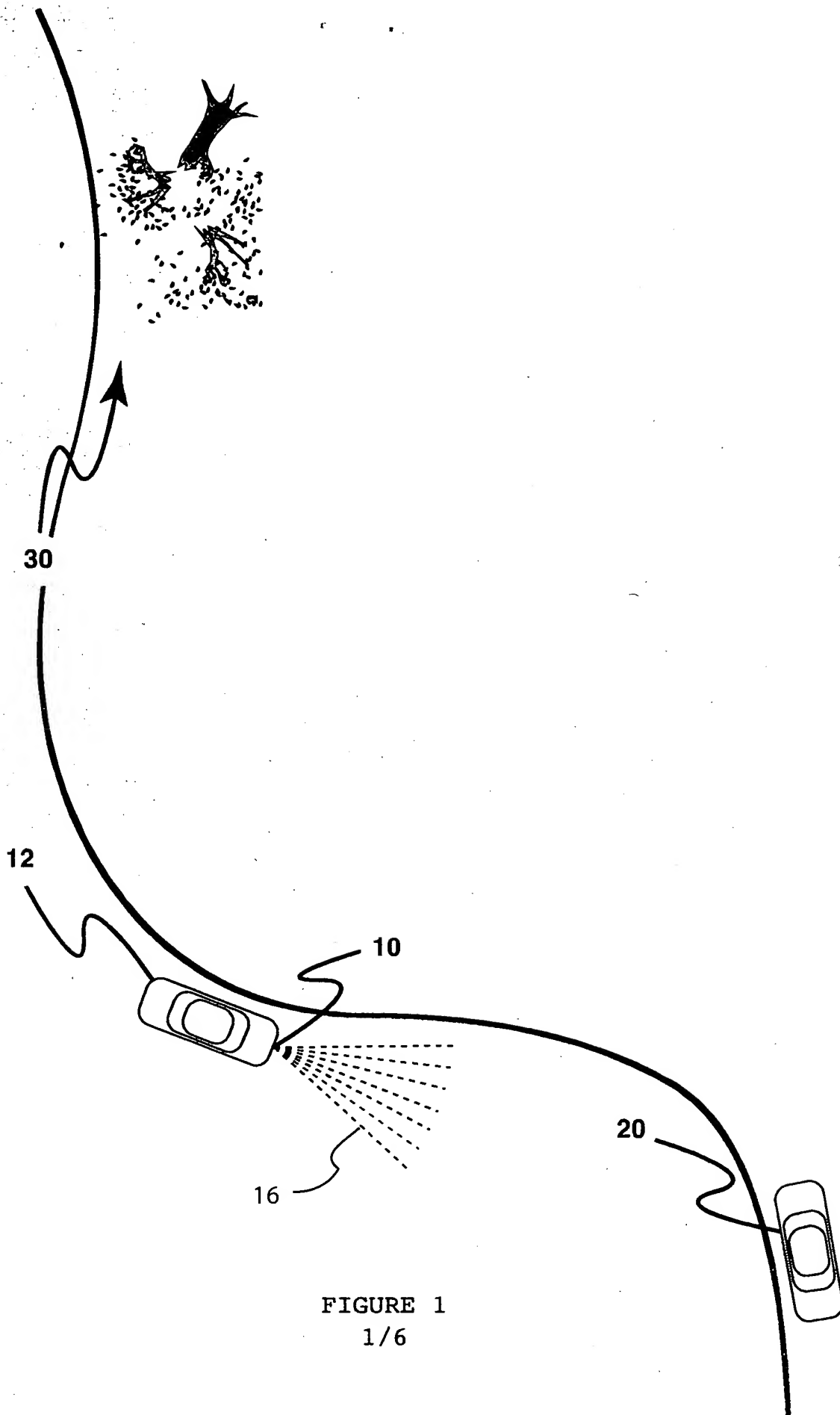


FIGURE 1  
1/6

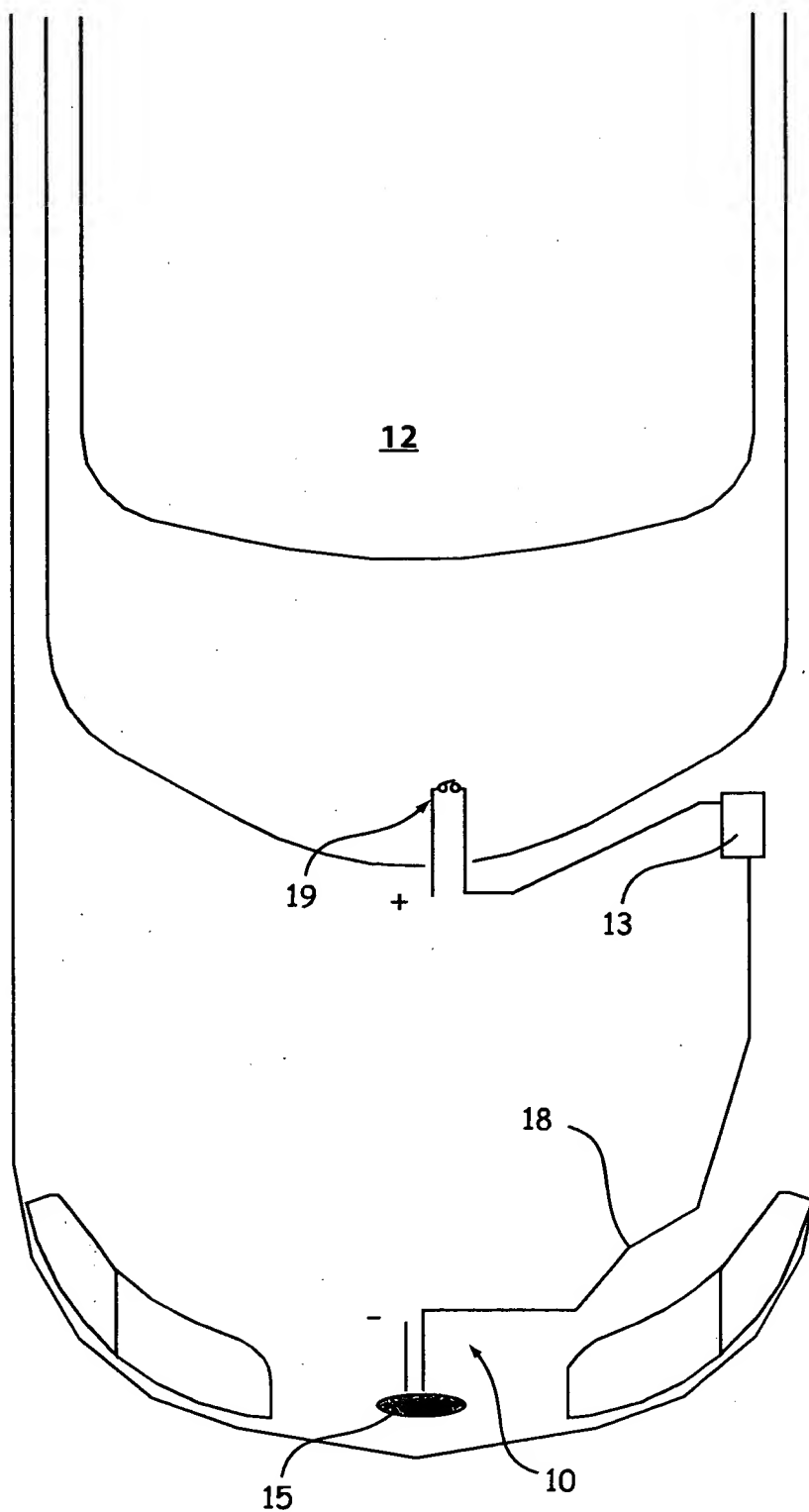


FIGURE 2  
2/6

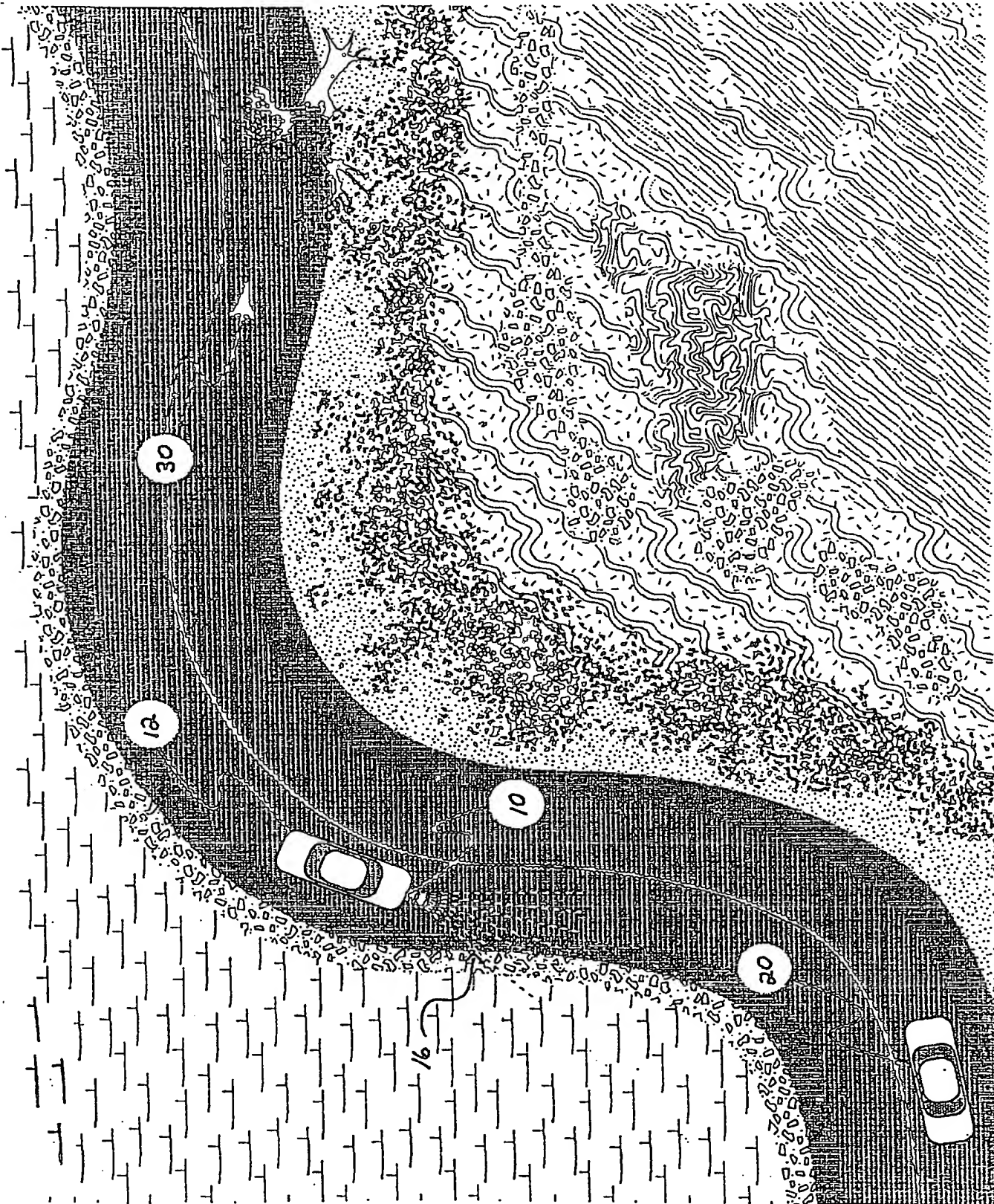


FIGURE 1  
1/6

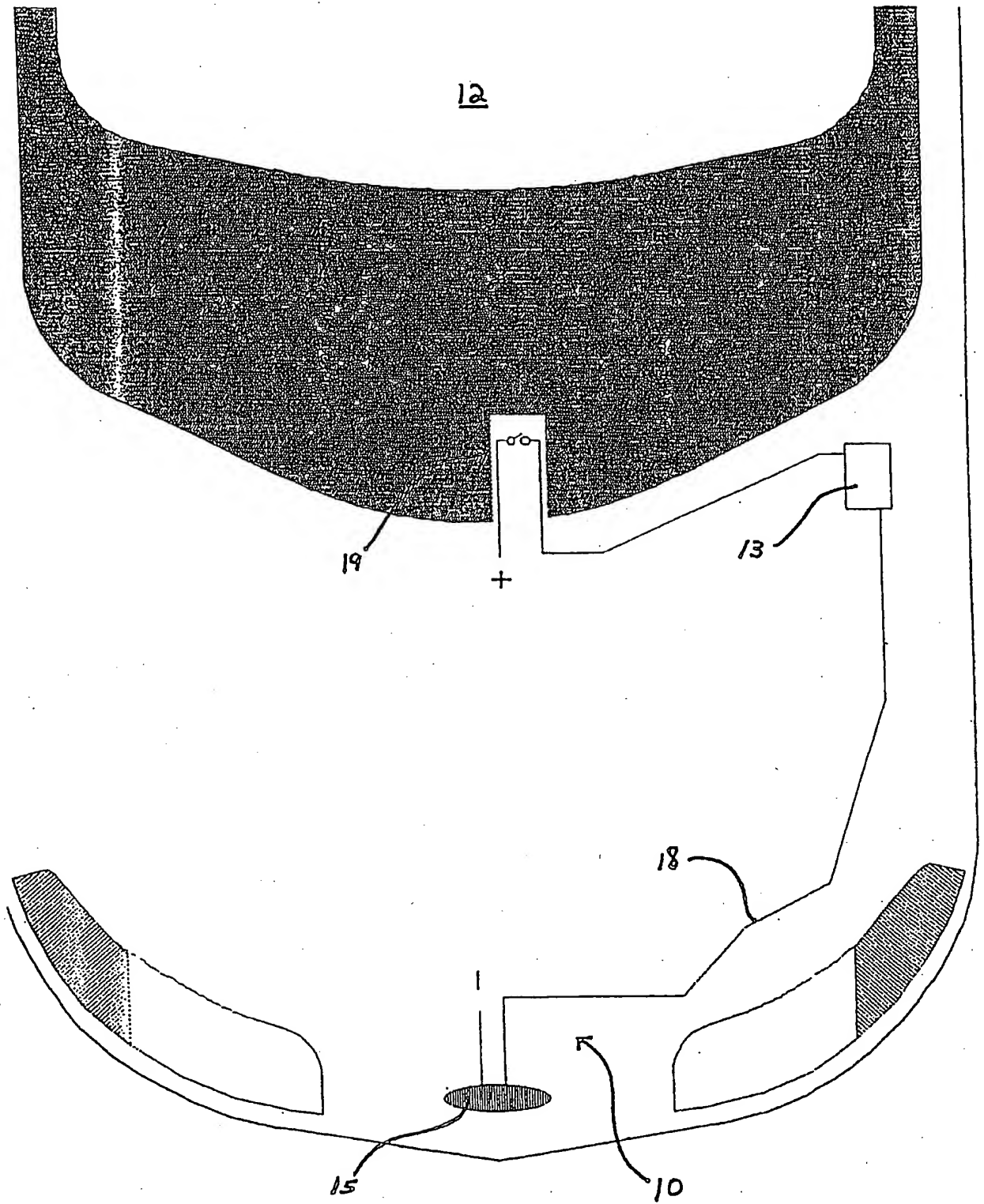


FIGURE 2  
2/6

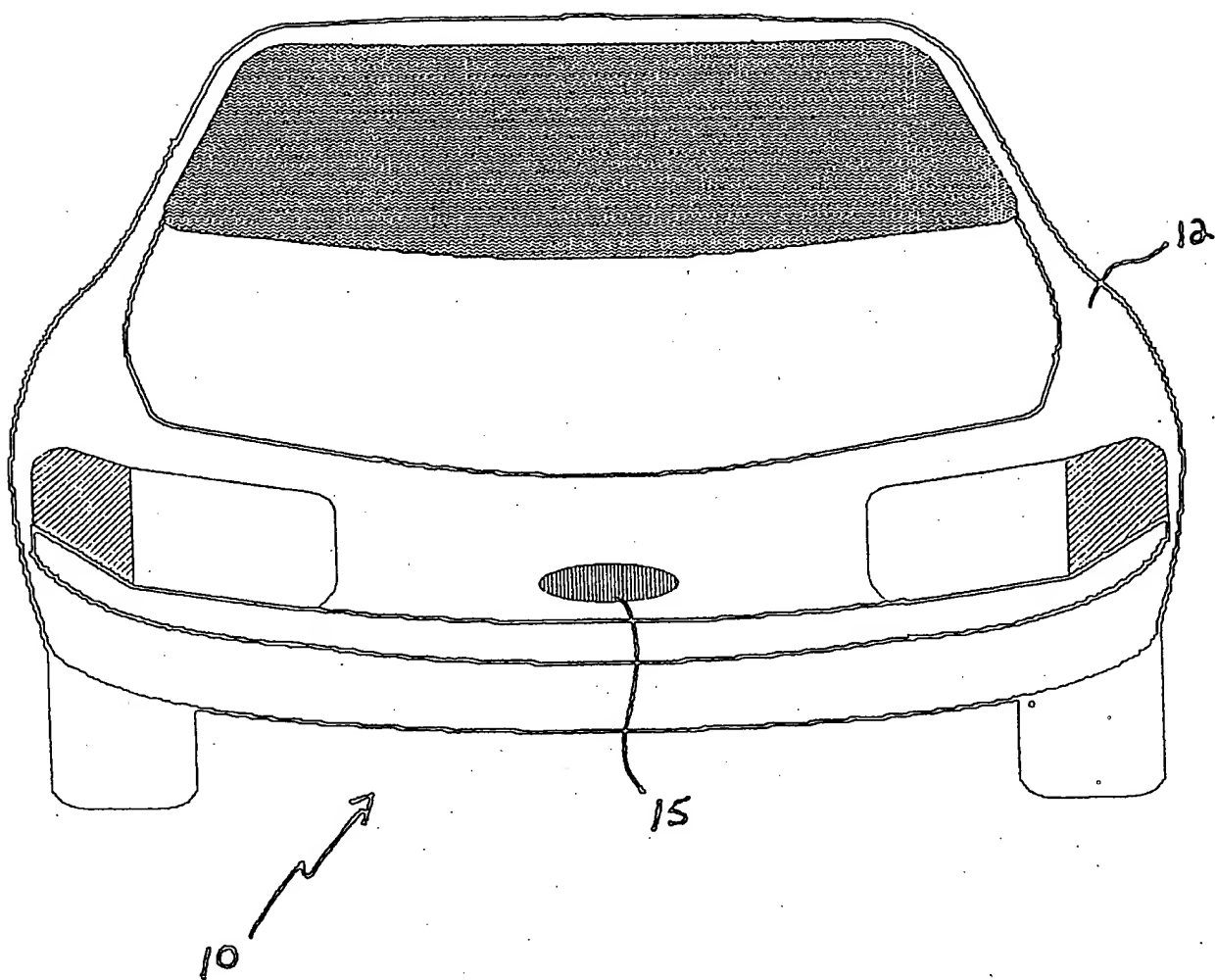


FIGURE 3  
3/6

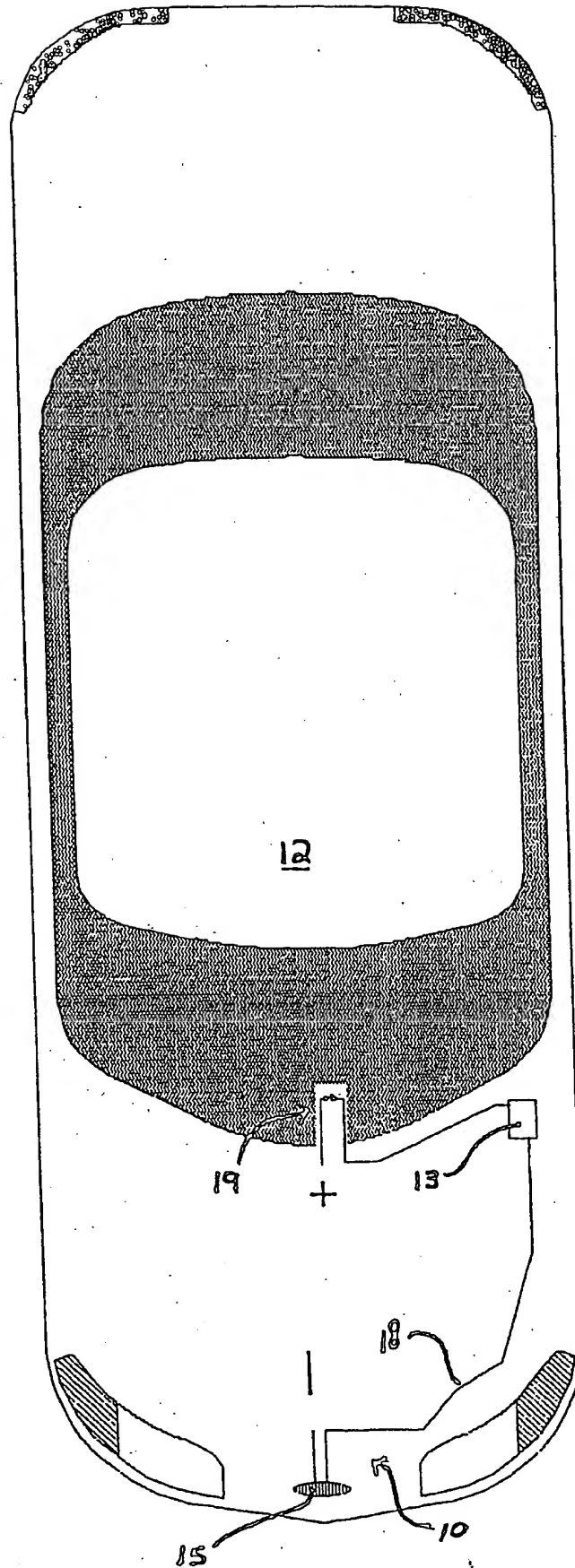


FIGURE 4  
4/6

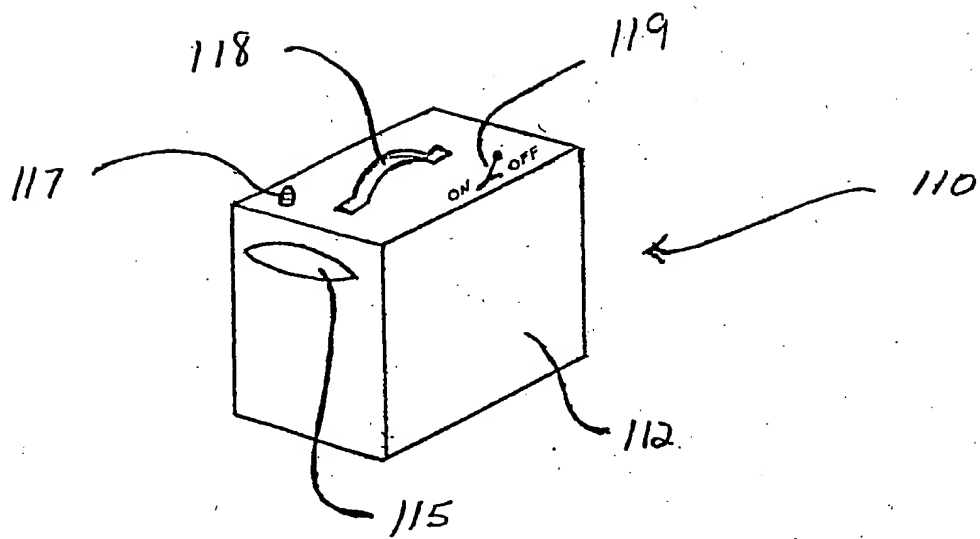


FIGURE 5  
5/6

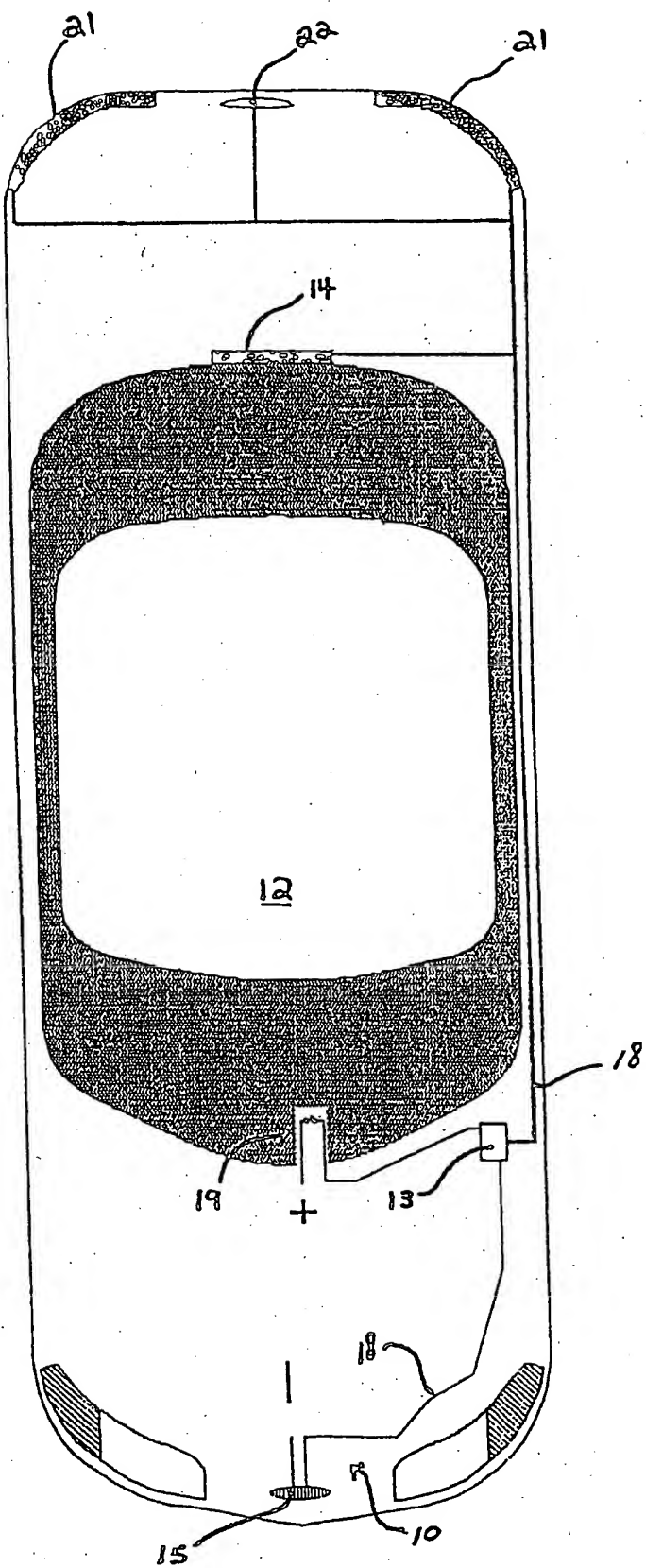


FIGURE 6  
6/6

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A cooperative advance warning system for use on a vehicle to warn  
5 drivers of oncoming vehicles of an upcoming, unexpected road hazard  
comprising:

a lamp mounted on the vehicle in a location where light emitted by said  
lamp is visible to drivers of the oncoming vehicles;

10 a switch means connected to said lamp for activating and deactivating  
said lamp, said switch means mounted to the vehicle in a location that is easily  
accessible to the driver of the vehicle; and

an electronic control means connected to said lamp for controlling the  
characteristics of the light emitted by said lamp, said electronic control means  
being capable of causing said lamp to flash on and off at a pre-determined  
15 frequency, said predetermined frequency being variable depending on the  
length of time said lamp has been activated.

2. A cooperative advance warning system according to claim 1, wherein  
said electronic control means comprises means to automatically deactivate said  
20 lamp after a pre-determined period of time following activation.

3. A cooperative advance warning system according to claims 1 or 2,  
wherein said pre-determined frequency is inversely proportional to the length  
of time said lamp has been activated.

25 4. A cooperative advance warning system according to claims 1 or 2,  
wherein said pre-determined frequency comprises a cadence.

5. A cooperative advance warning system according to claims 1, 2, 3 or 4, wherein said electronic control means further comprises means to maintain said pre-determined frequency or cadence at a particular value for an indefinite period.

5

6. A cooperative advance warning system according to claims 1, 2, 3, 4, or 5, further comprising an in-use indicator light connected to said switch means and to said electronic control means for indicating to the driver of the vehicle when the cooperative advance warning system is operating.

10

7. A cooperative advance warning system according to claims 1, 2, 3, 4, 5, or 6, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

15

8. A portable cooperative advance warning system for use in warning drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising:

a housing;

a lamp mounted to said housing;

20

a switch means mounted on said housing and connected to said lamp for activating and deactivating said lamp;

an electronic control means mounted to said housing and connected to said lamp for controlling the characteristics of the light emitted by said lamp, said electronic control means being capable of causing said lamp to flash on and off at a pre-determined frequency, said predetermined frequency being

25

variable depending on the distance from the road hazard; and

a power supply for providing power to the system.

9. A portable cooperative advance warning system according to claim 8, wherein said pre-determined frequency comprises a cadence.

10. A portable cooperative advance warning system according to claims 8 and 9, further comprising an in-use indicator light connected to said switch means and to said electronic control means for indicating when the cooperative advance warning system is operating.

11. A portable cooperative advance warning system according to claims 8, 9 or 10 wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

12. A cooperative advance warning system according to claim 1, for use on a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle brake lights,

said electronic control means being capable of causing the vehicle brake lights to flash on and off at a high frequency upon activation of the advance warning system.

20

13. A cooperative advance warning system according to claims 1 or 12, further comprising:

a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing warning light,

25

said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system.

14. A cooperative advance warning system according to claims 12 or 13, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system

5 15. A cooperative advance warning system according to claim 13, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

10 16. A cooperative advance warning system according to claim 1, for use on a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle brake lights,

15 said electronic control means being capable of causing the vehicle brake lights and said lamp to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp and the vehicle brake lights.

20 17. A cooperative advance warning system according to claims 1 or 16 further comprising:

a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing warning light,

25 said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

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<b>(21) International Application Number:</b> PCT/CA99/00598 <b>(22) International Filing Date:</b> 30 June 1999 (30.06.99)  <b>(30) Priority Data:</b> 2,242,023                      30 June 1998 (30.06.98)                      CA  <b>(71)(72) Applicant and Inventor:</b> ROWLEDGE, Darrel [CA/CA]; 2428 Capital Hill Crescent, N.W., Calgary, Alberta T2M 4M2 (CA).  <b>(74) Agent:</b> JARZYNA, Andrew, K.; Moffat & Co., Station D, P.O. Box 2088, Ottawa, Ontario K1P 5W3 (CA).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> CO-OPERATIVE ADVANCE WARNING SYSTEM FOR ROAD HAZARDS		
<b>(57) Abstract</b>  <p>The present invention is a cooperative advance warning system for use in warning oncoming traffic of unexpected upcoming road hazards. The system comprises a lamp mounted on a vehicle so that light emitted by the lamp is visible to drivers of oncoming vehicles, a switch accessible to the driver for activating the lamp when the driver comes upon an unexpected road hazard, and an electronic control unit for controlling the characteristics of the light emitted from the lamp.</p> <div data-bbox="841 1186 1523 2039" data-label="Image"> </div>		

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## **CO-OPERATIVE ADVANCE WARNING SYSTEM FOR ROAD HAZARDS**

### **FIELD OF INVENTION**

5

The present invention generally relates to advance warning systems for road hazards and more specifically it relates to a cooperative advance warning system for vehicles that can be activated by the driver of a vehicle to warn oncoming drivers of unexpected upcoming hazards.

10

### **BACKGROUND OF THE INVENTION**

15

Motor vehicle accidents kill thousands of people in North America and world wide each year. Many of these accidents are either directly or indirectly caused by unexpected road hazards which can include anything from wildlife or livestock on the road to stalled cars, fog banks, black ice, smoke, fallen rock vehicle and other accidents, farm and various other machinery, lost loads and vehicle debris, downed trees, wash-outs, snowslides, mud slides and the like. These hazards are dangerous, and often cause accidents, precisely because they are unexpected.

20

Advance warning of such random, unexpected road hazards, sufficient to alert the driver of an oncoming vehicle and permit him or her time to slow down or stop, is all that is normally required to prevent an accident.

25

Currently, however, even where drivers negotiate such circumstances and are therefore aware of the unusual danger or condition lying ahead of the oncoming traffic, and wish to warn oncoming drivers, there is no established

or accepted, safe and reliable method or device to allow them to communicate an advance warning to approaching vehicles.

5 While flashing one's headlights could be interpreted as such a warning, it is cumbersome and generally not understood as a signal connoting impending danger. Plus, one would have to repeatedly flash the vehicle headlights for each oncoming vehicle or group of vehicles. In addition, such practice is not advisable at night since either human or mechanical failure to get the lights back on presents a significant danger in itself. An additional  
10 problem with head light flashing, is that the driver of the oncoming vehicle has no way of knowing the distance to the upcoming, unexpected road hazard. This may result in the driver relaxing and speeding up just before coming upon the hazard.

15 Similarly, four-way flashers, which flash signal lights at all four corners of the vehicle simultaneously, indicate that the flashing vehicle is, itself, the hazard. Turn signals indicate turns. Even hand signals are of little value.

## 20 SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a cooperative advance warning system for road hazards that will enable drivers to warn oncoming traffic of unusual and unexpected hazards which obviates  
25 and mitigates from the disadvantages of the prior methods.

A further object of the present invention is to provide a cooperative advance warning system for road hazards which is easy and convenient to

initiate and requires little effort or distraction of the driver and which delivers an advance warning to oncoming drivers that is clear, obvious, unmistakable and which will not be confused with any other signal.

5           It is a further object of a preferred embodiment of the present invention to provide a cooperative advance warning system for road hazards that can be used to warn oncoming drivers of upcoming, unexpected road hazards and indicate to them whether the hazard is relatively near or far.

10           According to the present invention, there is provided a cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising: a lamp mounted on the vehicle in a location where light emitted by the lamp is visible to drivers of the oncoming vehicles; a switch means connected to the lamp for activating  
15           and deactivating the lamp, the switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and an electronic control means connected to the lamp for controlling the characteristics of the light emitted by the lamp.

20           According to another aspect of the present invention, there is provided a portable cooperative advance warning system for use in warning drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising: a housing; a lamp mounted to the housing; a switch means mounted on the housing and connected to the lamp for activating and deactivating the lamp; an  
25           electronic control means mounted to the housing and connected to the lamp for controlling the characteristics of the light emitted by the lamp; and a power supply for providing power to the system.

The present invention advantageously provides a cooperative advance warning system for road hazards which is inexpensive and easy to use. A further advantage is that it can be easily adapted to and installed on any vehicle, new or old. Another advantage is that the present system avoids  
5 confusing drivers of oncoming vehicles by providing a warning which is specific to an upcoming, unexpected road hazard. Yet another advantage is that the present system is easy and convenient to initiate, takes little effort and causes little distraction to the driver. Additionally, an important advantage of a preferred embodiment of the present invention is that it can indicate to  
10 drivers of oncoming vehicles whether the road hazard is near or far.

Other advantages, objects and features of the present invention will be readily apparent to those skilled in the art from a review of the following detailed descriptions of a preferred embodiment in conjunction with the  
15 accompanying drawings and claims.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Preferred embodiments of the present invention will now be described  
20 in greater detail, and will be better understood when read in conjunction with the following drawings, in which:

Figure 1, is a schematic representation of a typical application of the present invention to warn drivers of oncoming vehicles of an upcoming,  
25 unexpected road hazard.

Figure 2, is a schematic, partially sectional, plan view of the front portion of a vehicle on which the present invention has been installed.

Figure 3, is a front perspective view of the vehicle shown in Figure 2.

Figure 4, is a schematic, partially sectional plan view of the entire vehicle shown in Figure 2.

5

Figure 5, is a perspective view of a portable version of the present invention.

Figure 6, is a schematic, partially sectional plan view of an alternative embodiment of the present invention installed on a vehicle.

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Similar references are used in different figures to denote similar components.

15

## **DETAILED DESCRIPTION OF THE INVENTION**

Figure 1 is a schematic representation of a typical application of the present invention. The cooperative advance warning system for road hazards 10 is shown installed on a vehicle 12. An oncoming vehicle 20 is shown approaching vehicle 12 and a road hazard 30 (in this case, a fallen tree) is shown partially blocking the driving lane of oncoming vehicle 20. In Figure 1, the driver of vehicle 12 sees road hazard 30 and activates cooperative advance warning system 10 which emits a light beam 16 that is clearly visible to the driver of oncoming vehicle 20. The driver of oncoming vehicle 20 is thus warned of upcoming, unexpected road hazard 30 and is provided with plenty of time to slow down and avoid the hazard.

20

25

Referring to Figures 2 and 4, cooperative advance warning system 10 comprises a lamp 15, one side of which is connected by electrically conductive wire 18, to an electronic control unit 13 and to one side of switch 19. The other side of switch 19 is connected to the positive side of the vehicle battery or power supply while the other side of lamp 15 is connected to the common vehicle ground. Activating switch 19 completes the circuit and causes lamp 15 to emit a beam of light 16 (see Figure 1) out of the front of vehicle 12. This light beam is clearly visible to the driver of oncoming vehicle 20, thus providing a warning to that driver of an upcoming, unexpected road hazard 30. An in-use indicator light (not shown), easily visible to the driver of vehicle 12, is connected to switch 19 and electronic control unit 13 to inform the driver when the system is operating.

In a preferred embodiment of the present invention, electronic control unit 13 is designed to cause lamp 15 to emit light in various patterns following initial activation. For example, lamp 15 can be caused to automatically deactivate after a predetermine length of time. Lamp 15 may also be caused to continuously flash on and off for a predetermine length of time to provide a more visible warning signal. In another example, the frequency of the on and off flashes of lamp 15 can be reduced over time, so that initially lamp 15 flashes rapidly to indicate that the road hazard is near and as the time interval from initial activation increases, the frequency of the flashes is decreased until lamp 15 is completely deactivated. In this example, there is an inverse proportional relationship between the frequency of the flashes and the time interval since activation. In a further example, the cadence of the flashes can be altered to correspond to the distance from the road hazard. Rapid single flashes could indicate imminent danger, while lower frequency double flashes could be used to indicate a more distance hazard, and still lower frequency



since in many cases, the approaching driver's view of pedestrians and the like is obscured by the lead vehicle. Streets with turn lanes, or having multiple lanes of traffic, present serious dangers to pedestrians attempting to cross such streets, even when attempting to do so at specially designated pedestrian corridors, since many of these corridors are not equipped with overhead warning lights. Vehicles stopping to allow pedestrians to cross in front often obscure the view for other approaching vehicles, especially those approaching from behind. Further, the driver of an approaching vehicle may assume that the stopped vehicle is itself the only hazard (perhaps the stopped vehicle is intending to turn without having signalled, or is allowing passengers to disembark, or perhaps has mechanical problems). Such assumption, in conjunction with the obstructed view of the pedestrians, can put the pedestrians in serious danger of being struck once they enter the adjacent lanes of traffic. The driver of the stopped vehicle currently has no way of warning other approaching vehicles that a pedestrian is crossing. The present invention, when used in the above-described urban or immediate mode can warn traffic approaching from both directions of the presence of a pedestrian or other hazard. Urban or immediate mode could also be used to warn traffic approaching from the rear of other hazards such as pets crossing, dangerous breaks in the road, lost loads, or other obstructions.

Figure 3 provides an example of a typical location for installation of cooperative advance warning system 10. Lamp 15 is shown to be installed on the front of vehicle 12, between and in-line with the two front head lights. However, it will be readily understood by those skilled in the field that lamp 15 can be placed in any location where its light would be plainly visible to drivers of oncoming vehicles.

With reference to Figures 1 to 4, the operation of the present invention will now be described in more detail. The cooperative advance warning system 10 is designed to provide all drivers of oncoming vehicles with advance warning of upcoming, unexpected road hazards. As vehicle 12 passes  
5 unexpected, road hazard 30, the driver of vehicle 12 will activate the cooperative advance warning system 10 using switch 19. Lamp 15 will thus be activated and emit a beam of light 16 to warn the driver of oncoming vehicle 20 of the upcoming, unexpected road hazard 30. This provides the driver of vehicle 20 sufficient time to slow down and avoid the hazard. Once  
10 vehicle 20 has confirmed the presence of road hazard 30, the driver of vehicle 20, when it is safe to do so, activates the cooperative advance warning system on his or her vehicle to warn drivers of vehicles approaching from the opposite direction. In this fashion, almost all drivers approaching unexpected road hazard 30 can be given ample warning to permit them to avoid the danger,  
15 thereby significantly reducing the probability of accident..

To use the urban or immediate mode of a preferred embodiment of the present invention as described above, the vehicle operator, upon encountering or stopping to permit a pedestrian to cross the street or encountering or  
20 stopping to avoid a road hazard, manually places switch 19 into urban or immediate mode. This causes the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21, and/or a separate rear-facing warning light 22 to flash on and off rapidly in conjunction with lamp 15, thereby  
25 warning all approaching vehicles of the presence of a pedestrian or other road hazard.

Light beam 16 emitted by lamp 15 can be of any highly visible and distinctive colour, however, the applicant has found the colours fuchsia and

pink to be most effective. The colour is selected to not only be visible in both daylight and at night, but also to distinguish from all other lights common on vehicles and in traffic. It is the applicant's expectation that all drivers, once they become knowledgeable of the present invention, will immediately learn to recognize and associate the colour and cadence of light emitted by lamp 15, and the cadence and flashing of the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21, and/or a separate rear-facing warning light 22, with an upcoming, unexpected road hazard.

As indicated above, lamp 15 can be made to flash at different frequencies and with differing cadence depending on the time interval since activation. This will indicate to the driver of oncoming vehicle 20 that road hazard 30 is either relatively near or far.

The present cooperative advance warning system may also be provided in a self-contained, stand-alone portable unit such as that shown in Figure 5. The portable cooperative advance warning system 110, as shown in Figure 5, has a housing 112 to which is mounted a lamp 115, a switch 119, an in-use indicator light 117 and a handle 118 for transporting the unit. Lamp 115, switch 119 and in-use indicator light 117 are connected to a power supply (not shown) and an electronic control unit (not shown) contained within housing 112. All of the components of the portable system 110 shown in Figure 5 are identical and perform the same functions as the corresponding components of the cooperative advanced warning system 10, described above and shown in Figures 1 to 4.

One further advantage of the portable cooperative advance warning system 110 herein described is that multiple units can be set up to warn traffic

approaching a road hazard from both directions. The units can be set to maintain a pre-determined frequency or cadence corresponding to their distance from the road hazard. Unlike flares which burn out and are generally associated with the direct site of a hazard, the portable cooperative advance warning system 110 can be used to provide considerable advance warning of an upcoming road hazard for extended periods of time.

The above-described embodiments of the present invention are meant to be illustrative of a preferred embodiment of the present invention and are not intended to limit the scope of the present invention. Various modifications, variations and adaptations, which would be readily apparent to one skilled in the art, are intended to be within the scope of the present invention. The only limitations to the scope of the present invention are set out in the following appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A cooperative advance warning system for use on a vehicle to warn  
5 drivers of oncoming vehicles of an upcoming, unexpected road hazard  
comprising:
  - a lamp mounted on the vehicle in a location where light emitted by the  
lamp is visible to drivers of the oncoming vehicles;
  - a switch means connected to the lamp for activating and deactivating  
10 the lamp, the switch means mounted to the vehicle in a location that is easily  
accessible to the driver of the vehicle; and
  - an electronic control means connected to the lamp for controlling the  
characteristics of the light emitted by the lamp.
- 15 2. A cooperative advance warning system according to claim 1, wherein  
the electronic control means comprises means to automatically deactivate the  
lamp after a pre-determined period of time following activation.
- 20 3. A cooperative advance warning system according to claim 2, wherein  
the electronic control means comprises means to cause the lamp to flash on  
and off at a pre-determined frequency.
4. A cooperative advance warning system according to claim 3, wherein  
the pre-determined frequency varies depending on the length of time the lamp  
25 has been activated.
5. A cooperative advance warning system according to claim 4, wherein  
the pre-determined frequency is inversely proportional to the length of time the  
lamp has been activated.

6. A cooperative advance warning system according to claims 3, 4 or 5,  
wherein the pre-determined frequency comprises a cadence.
7. A cooperative advance warning system according to claims 3, 4, 5 or 6,  
5 wherein the electronic control means further comprises means to maintain the  
pre-determined frequency or cadence at a particular value for an indefinite  
period.
8. A cooperative advance warning system according to claims 1, 2, 3, 4,  
10 5, 6 or 7, further comprising an in-use indicator light connected to the switch  
means and to the electronic control means for indicating to the driver of the  
vehicle when the cooperative advance warning system is operating.
9. A cooperative advance warning system according to claims 1, 2, 3, 4,  
15 5, 6, 7 or 8, wherein the colour of light emitted by the lamp is selected from  
the group of colours consisting of fuchsia and pink.
10. A portable cooperative advance warning system for use in warning  
drivers of oncoming vehicles of an upcoming, unexpected road hazard  
20 comprising:  
a housing;  
a lamp mounted to the housing;  
a switch means mounted on the housing and connected to the lamp for  
activating and deactivating the lamp;  
25 an electronic control means mounted to the housing and connected to  
the lamp for controlling the characteristics of the light emitted by the lamp;  
and  
a power supply for providing power to the system.

11. A portable cooperative advance warning system according to claim 10, wherein the electronic control means comprises means to cause the lamp to flash on and off at a pre-determined frequency.
- 5 12. A portable cooperative advance warning system according to claim 11, wherein the pre-determined frequency can be varied depending on the distance from the road hazard.
- 10 13. A portable cooperative advance warning system according to claims 11 or 12, wherein the pre-determined frequency comprises a cadence.
- 15 14. A portable cooperative advance warning system according to claims 10, 11, 12 or 13, further comprising an in-use indicator light connected to the switch means and to the electronic control means for indicating when the cooperative advance warning system is operating.
- 20 15. A portable cooperative advance warning system according to claims 10, 11, 12, 13 or 14 wherein the colour of light emitted by the lamp is selected from the group of colours consisting of fuchsia and pink.
- 25 16. A cooperative advance warning system according to claim 1, further comprising:  
a connection between the electronic control means and the vehicle brake lights; and  
means contained within the electronic control means to flash the vehicle brake lights on and off at a high frequency upon activation of the advance warning system.

17. A cooperative advance warning system according to claim 1 or 16 further comprising:

a rear-facing warning light mounted on the rear of the vehicle;

a connection between the electronic control means and the rear-facing warning light; and

means contained within the electronic control means to flash the rear-facing warning light on and off at a high frequency upon activation of the advance warning system.

18. A cooperative advance warning system according to claim 16, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system

19. A cooperative advance warning system according to claim 1 and 17, wherein the rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

20. A cooperative advance warning system according to claim 1, further comprising:

a connection between the electronic control means and the vehicle brake lights; and

means contained within the electronic control means to flash the vehicle brake lights and the lamp on and off at a high frequency upon activation of the advance warning system,

wherein the switch has a first mode for activating and deactivating the lamp, and a second mode for activating and deactivating both the lamp and the brake lights.

21. A cooperative advance warning system according to claim 1 or 20  
further comprising:

a rear-facing warning light mounted on the rear of the vehicle;

5 a connection between the electronic control means and the rear-facing  
warning light; and

means contained within the electronic control means to flash the rear-  
facing warning light on and off at a high frequency upon activation of the  
advance warning system.

## **CO-OPERATIVE ADVANCE WARNING SYSTEM FOR ROAD HAZARDS**

### **FIELD OF INVENTION**

5

The present invention generally relates to advance warning systems for road hazards and more specifically it relates to a cooperative advance warning system for vehicles that can be activated by the driver of a vehicle to warn oncoming drivers of unexpected upcoming hazards.

10

### **BACKGROUND OF THE INVENTION**

Motor vehicle accidents kill thousands of people in North America and world wide each year. Many of these accidents are either directly or indirectly caused by unexpected road hazards which can include anything from wildlife or livestock on the road to stalled cars, fog banks, black ice, smoke, fallen rock vehicle and other accidents, farm and various other machinery, lost loads and vehicle debris, downed trees, wash-outs, snowslides, mud slides and the like. These hazards are dangerous, and often cause accidents, precisely because they are unexpected.

20

Advance warning of such random, unexpected road hazards, sufficient to alert the driver of an oncoming vehicle and permit him or her time to slow down or stop, is all that is normally required to prevent an accident.

25

Currently, however, even where drivers negotiate such circumstances and are therefore aware of the unusual danger or condition lying ahead of the oncoming traffic, and wish to cooperate with [warn] oncoming drivers to warn them of the danger, there is no established or accepted, safe and reliable

method or device to allow them to communicate an advance warning to approaching vehicles.

While flashing one's headlights could be interpreted as such a warning,  
5 it is cumbersome and generally not understood as a signal connoting impending danger. Plus, one would have to repeatedly flash the vehicle headlights for each oncoming vehicle or group of vehicles. In addition, such practice is not advisable at night since either human or mechanical failure to get the lights  
10 back on presents a significant danger in itself. An additional problem with head light flashing, is that the driver of the oncoming vehicle has no way of knowing the distance to the upcoming, unexpected road hazard. This may result in the driver relaxing and speeding up just before coming upon the hazard.

Similarly, four-way flashers, which flash signal lights at all four corners  
15 of the vehicle simultaneously, indicate that the flashing vehicle is, itself, the hazard. Turn signals indicate turns. Even hand signals are of little value.

In United States Patent No. 5,237,306, issued to Robert Adell on  
20 August 17, 1993, a signalling system is described for requesting a driver of a motor vehicle to dim or turn on his vehicle's headlights, but Adell provides no means for warning on-coming drivers of an upcoming road hazard, or for informing them of the relative location of that road hazard.

What is needed, then, is a means for vehicle drivers to cooperate with  
25 drivers of oncoming vehicles, to warn them of an upcoming, unexpected road hazard, and to preferably provide those drivers with some information as to the location of such hazard.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a cooperative advance warning system for road hazards that will enable drivers to warn oncoming traffic of unusual and unexpected hazards which obviates and mitigates from the disadvantages of the prior methods.

A further object of the present invention is to provide a cooperative advance warning system for road hazards which is easy and convenient to initiate and requires little effort or distraction of the driver and which delivers an advance warning to oncoming drivers that is clear, obvious, unmistakable and which will not be confused with any other signal.

It is a further object of a preferred embodiment of the present invention to provide a cooperative advance warning system for road hazards that can be used to warn oncoming drivers of upcoming, unexpected road hazards and indicate to them whether the hazard is relatively near or far.

According to the present invention, there is provided a cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising: a lamp mounted on the vehicle in a location where light emitted by the lamp is visible to drivers of the oncoming vehicles; a switch means connected to the lamp for activating and deactivating the lamp, the switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and an electronic control means connected to the lamp for controlling the characteristics of the light emitted by the lamp, the electronic control means being capable of causing the lamp to flash on and off at a pre-determined frequency, the predetermined

frequency being variable depending on the length of time the lamp has been activated

According to another aspect of the present invention, there is provided  
5 a portable cooperative advance warning system for use in warning drivers of  
oncoming vehicles of an upcoming, unexpected road hazard comprising: a  
housing; a lamp mounted to the housing; a switch means mounted on the  
housing and connected to the lamp for activating and deactivating the lamp; an  
electronic control means mounted to the housing and connected to the lamp for  
10 controlling the characteristics of the light emitted by the lamp, the electronic  
control means being capable of causing the lamp to flash on and off at a pre-  
determined frequency, the predetermined frequency being variable depending  
on the distance from the road hazard; and a power supply for providing power  
to the system.

15 The present invention advantageously provides a cooperative advance  
warning system for road hazards which is inexpensive and easy to use. A  
further advantage is that it can be easily adapted to and installed on any vehicle,  
new or old. Another advantage is that the present system avoids confusing  
20 drivers of oncoming vehicles by providing a warning which is specific to an  
upcoming, unexpected road hazard. Yet another advantage is that the present  
system is easy and convenient to initiate, takes little effort and causes little  
distraction to the driver. Additionally, an important advantage of a preferred  
embodiment of the present invention is that it can indicate to drivers of  
25 oncoming vehicles whether the road hazard is near or far.

Other advantages, objects and features of the present invention will be  
readily apparent to those skilled in the art from a review of the following

detailed descriptions of a preferred embodiment in conjunction with the accompanying drawings and claims.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

5

Preferred embodiments of the present invention will now be described in greater detail, and will be better understood when read in conjunction with the following drawings, in which:

10

Figure 1, is a schematic representation of a typical application of the present invention to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard.

15

Figure 2, is a schematic, partially sectional, plan view of the front portion of a vehicle on which the present invention has been installed.

Figure 3, is a front perspective view of the vehicle shown in Figure 2.

Figure 4, is a schematic, partially sectional plan view of the entire vehicle shown in Figure 2.

5

Figure 5, is a perspective view of a portable version of the present invention.

Figure 6, is a schematic, partially sectional plan view of an alternative embodiment of the present invention installed on a vehicle.

10

Similar references are used in different figures to denote similar components.

15

## **DETAILED DESCRIPTION OF THE INVENTION**

20

Figure 1 is a schematic representation of a typical application of the present invention. The cooperative advance warning system for road hazards **10** is shown installed on a vehicle **12**. An oncoming vehicle **20** is shown approaching vehicle **12** and a road hazard **30** (in this case, a fallen tree) is shown partially blocking the driving lane of oncoming vehicle **20**. In Figure 1, the driver of vehicle **12** sees road hazard **30** and activates cooperative advance warning system **10** which emits a light beam **16** that is clearly visible to the driver of oncoming vehicle **20**. The driver of oncoming vehicle **20** is thus warned of upcoming, unexpected road hazard **30** and is provided with plenty of time to slow down and avoid the hazard.

25

Referring to Figures 2 and 4, cooperative advance warning system 10 comprises a lamp 15, one side of which is connected by electrically conductive wire 18, to an electronic control unit 13 and to one side of switch 19. The other side of switch 19 is connected to the positive side of the vehicle battery or power supply while the other side of lamp 15 is connected to the common vehicle ground. Activating switch 19 completes the circuit and causes lamp 15 to emit a beam of light 16 (see Figure 1) out of the front of vehicle 12. This light beam is clearly visible to the driver of oncoming vehicle 20, thus providing a warning to that driver of an upcoming, unexpected road hazard 30. An in-use indicator light (not shown), easily visible to the driver of vehicle 12, is connected to switch 19 and electronic control unit 13 to inform the driver when the system is operating.

In a preferred embodiment of the present invention, electronic control unit 13 is designed to cause lamp 15 to emit light in various patterns following initial activation. For example, lamp 15 can be caused to automatically deactivate after a predetermine length of time. Lamp 15 may also be caused to continuously flash on and off for a predetermine length of time to provide a more visible warning signal. In another example, the frequency of the on and off flashes of lamp 15 can be reduced over time, so that initially lamp 15 flashes rapidly to indicate that the road hazard is near and as the time interval from initial activation increases, the frequency of the flashes is decreased until lamp 15 is completely deactivated. In this example, there is an inverse proportional relationship between the frequency of the flashes and the time interval since activation. In a further example, the cadence of the flashes can be altered to correspond to the distance from the road hazard. Rapid single flashes could indicate imminent danger, while lower frequency double flashes could be used to indicate a more distance hazard, and still lower frequency triple flashes could

signify a far off problem. In yet another example, the frequency or cadence of the flashing light can be selected and maintained at a given value to permit a parked vehicle to be used to continuously warn on coming traffic of an impending hazard. In this example, lamp 15 will remain flashing at the selected frequency or cadence until deactivated by the operator.

Referring to Figure 6, in yet another preferred embodiment of the present invention there is provided a connection, by way of electrically conductive wire 18, between electronic control unit 13 and the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21 of the vehicle, and/or a separate rear-facing warning light 22. Upon activation of the system, the centre high-mounted brake light 14 and/or rear tail-mounted brake lights 21 of the vehicle, and/or the separate rear-facing warning light 22, are caused to flash rapidly on and off in conjunction with lamp 15 for a brief period of perhaps 10 seconds. This acts as an immediate warning to any vehicle travelling behind vehicle 12 to be on the lookout for a road hazard.

In a further variation of this preferred embodiment of the present invention, switch 19 is provided with an alternative position called the urban or immediate mode. When the system is switched into or held in this urban or immediate mode, control unit 13 causes lamp 15, the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21, and/or a separate rear-facing warning light 22, to rapidly flash on and off for as long as switch 19 remains in the urban or immediate position.

Urban or immediate mode can be used to warn vehicles approaching from both directions of an immediate hazard, such as a pedestrian crossing the street, but is especially effective in warning vehicles approaching from the rear

since in many cases, the approaching driver's view of pedestrians and the like is obscured by the lead vehicle. Streets with turn lanes, or having multiple lanes of traffic, present serious dangers to pedestrians attempting to cross such streets, even when attempting to do so at specially designated pedestrian corridors, since many of these corridors are not equipped with overhead warning lights. Vehicles stopping to allow pedestrians to cross in front often obscure the view for other approaching vehicles, especially those approaching from behind. Further, the driver of an approaching vehicle may assume that the stopped vehicle is itself the only hazard (perhaps the stopped vehicle is intending to turn without having signalled, or is allowing passengers to disembark, or perhaps has mechanical problems). Such assumption, in conjunction with the obstructed view of the pedestrians, can put the pedestrians in serious danger of being struck once they enter the adjacent lanes of traffic. The driver of the stopped vehicle currently has no way of warning other approaching vehicles that a pedestrian is crossing. The present invention, when used in the above-described urban or immediate mode can warn traffic approaching from both directions of the presence of a pedestrian or other hazard. Urban or immediate mode could also be used to warn traffic approaching from the rear of other hazards such as pets crossing, dangerous breaks in the road, lost loads, or other obstructions.

Figure 3 provides an example of a typical location for installation of cooperative advance warning system 10. Lamp 15 is shown to be installed on the front of vehicle 12, between and in-line with the two front head lights. However, it will be readily understood by those skilled in the field that lamp 15 can be placed in any location where its light would be plainly visible to drivers of oncoming vehicles.

With reference to Figures 1 to 4, the operation of the present invention will now be described in more detail. The cooperative advance warning system 10 is designed to provide all drivers of oncoming vehicles with advance warning of upcoming, unexpected road hazards. As vehicle 12 passes  
5 unexpected, road hazard 30, the driver of vehicle 12 will activate the cooperative advance warning system 10 using switch 19. Lamp 15 will thus be activated and emit a beam of light 16 to warn the driver of oncoming vehicle 20 of the upcoming, unexpected road hazard 30. This provides the driver of vehicle 20 sufficient time to slow down and avoid the hazard. Once vehicle 20  
10 has confirmed the presence of road hazard 30, the driver of vehicle 20, when it is safe to do so, activates the cooperative advance warning system on his or her vehicle to warn drivers of vehicles approaching from the opposite direction. In this fashion, almost all drivers approaching unexpected road hazard 30 can be given ample warning to permit them to avoid the danger, thereby significantly  
15 reducing the probability of accident..

To use the urban or immediate mode of a preferred embodiment of the present invention as described above, the vehicle operator, upon encountering or stopping to permit a pedestrian to cross the street or encountering or  
20 stopping to avoid a road hazard, manually places switch 19 into urban or immediate mode. This causes the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21, and/or a separate rear-facing warning light 22 to flash on and off rapidly in conjunction with lamp 15, thereby warning all approaching vehicles of the presence of a pedestrian or other road  
25 hazard.

Light beam 16 emitted by lamp 15 can be of any highly visible and distinctive colour, however, the applicant has found the colours fuchsia and

pink to be most effective. The colour is selected to not only be visible in both daylight and at night, but also to distinguish from all other lights common on vehicles and in traffic. It is the applicant's expectation that all drivers, once they become knowledgeable of the present invention, will immediately learn to recognize and associate the colour and cadence of light emitted by lamp 15, and the cadence and flashing of the centre high-mounted brake light 14, and/or the rear tail-mounted brake lights 21, and/or a separate rear-facing warning light 22, with an upcoming, unexpected road hazard.

As indicated above, lamp 15 can be made to flash at different frequencies and with differing cadence depending on the time interval since activation. This will indicate to the driver of oncoming vehicle 20 that road hazard 30 is either relatively near or far.

The present cooperative advance warning system may also be provided in a self-contained, stand-alone portable unit such as that shown in Figure 5. The portable cooperative advance warning system 110, as shown in Figure 5, has a housing 112 to which is mounted a lamp 115, a switch 119, an in-use indicator light 117 and a handle 118 for transporting the unit. Lamp 115, switch 119 and in-use indicator light 117 are connected to a power supply (not shown) and an electronic control unit (not shown) contained within housing 112. All of the components of the portable system 110 shown in Figure 5 are identical and perform the same functions as the corresponding components of the cooperative advanced warning system 10, described above and shown in Figures 1 to 4.

One further advantage of the portable cooperative advance warning system 110 herein described is that multiple units can be set up to warn traffic

approaching a road hazard from both directions. The units can be set to maintain a pre-determined frequency or cadence corresponding to their distance from the road hazard. Unlike flares which burn out and are generally associated with the direct site of a hazard, the portable cooperative advance warning system **110** can be used to provide considerable advance warning of an upcoming road hazard for extended periods of time.

The above-described embodiments of the present invention are meant to be illustrative of a preferred embodiment of the present invention and are not intended to limit the scope of the present invention. Various modifications, variations and adaptations, which would be readily apparent to one skilled in the art, are intended to be within the scope of the present invention. The only limitations to the scope of the present invention are set out in the following appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS  
FOLLOWS:

- 5        1.        A cooperative advance warning system for use on a vehicle to warn  
drivers of oncoming vehicles of an upcoming, unexpected road hazard  
comprising:
- a lamp mounted on the vehicle in a location where light emitted by said  
lamp is visible to drivers of the oncoming vehicles;
- 10        a switch means connected to said lamp for activating and deactivating  
said lamp, said switch means mounted to the vehicle in a location that is easily  
accessible to the driver of the vehicle; and
- an electronic control means connected to said lamp for controlling the  
characteristics of the light emitted by said lamp, said electronic control means  
15        being capable of causing said lamp to flash on and off at a pre-determined  
frequency, said predetermined frequency being variable in proportion to  
[depending on] the length of time said lamp has been activated.
- 20        2.        A cooperative advance warning system according to claim 1, wherein  
said electronic control means comprises means to automatically deactivate said  
lamp after a pre-determined period of time following activation.
- 25        3.        A cooperative advance warning system according to claim 1, wherein  
said pre-determined frequency is inversely proportional to the length of time  
said lamp has been activated.
4.        A cooperative advance warning system according to claim 1, wherein  
said pre-determined frequency comprises a cadence.

5. A cooperative advance warning system according to claim 1, wherein said electronic control means further comprises means to maintain said pre-determined frequency or cadence at a particular value for an indefinite period.
- 5 6. A cooperative advance warning system according to claim 1, further comprising an in-use indicator light connected to said switch means and to said electronic control means for indicating to the driver of the vehicle when the cooperative advance warning system is operating.
- 10 7. A cooperative advance warning system according to claim 1, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.
8. ~~A portable cooperative advance warning system for use in warning~~  
15 ~~drivers of oncoming vehicles of an upcoming, unexpected road hazard~~  
~~comprising:~~  
~~—— a housing;~~  
~~—— a lamp mounted to said housing;~~  
~~—— a switch means mounted on said housing and connected to said lamp~~  
20 ~~for activating and deactivating said lamp;~~  
~~—— an electronic control means mounted to said housing and connected to~~  
~~said lamp for controlling the characteristics of the light emitted by said lamp;~~  
~~said electronic control means being capable of causing said lamp to flash on~~  
~~and off at a pre-determined frequency, said predetermined frequency being~~  
25 ~~variable depending on the distance from the road hazard; and~~  
~~—— a power supply for providing power to the system.~~

9. ~~A portable cooperative advance warning system according to claim 8;  
wherein said pre-determined frequency comprises a cadence.~~

10. ~~A portable cooperative advance warning system according to claim 8;  
further comprising an in-use indicator light connected to said switch means and  
to said electronic control means for indicating when the cooperative advance  
warning system is operating.~~

11. ~~A portable cooperative advance warning system according to claim 8;  
wherein the colour of light emitted by said lamp is selected from the group of  
colours consisting of fuchsia and pink.~~

12. A cooperative advance warning system according to claim 1, for use on  
a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle  
brake lights,

said electronic control means being capable of causing the vehicle brake  
lights to flash on and off at a high frequency upon activation of the advance  
warning system.

13. A cooperative advance warning system according to claim 1, further  
comprising:

a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing  
warning light,

said electronic control means being capable of causing said rear-facing  
warning light to flash on and off at a high frequency upon activation of the  
advance warning system.

14. A cooperative advance warning system according to claim 12, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

5 15. A cooperative advance warning system according to claim 13, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

10 16. A cooperative advance warning system according to claim 1, for use on a vehicle having brake lights, further comprising:

a connection between said electronic control means and the vehicle brake lights,

15 said electronic control means being capable of causing the vehicle brake lights and said lamp to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp and the vehicle brake lights.

20 17. A cooperative advance warning system according to claim 1, further comprising:

a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing warning light,

25 said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

5      18. A cooperative advance warning system according to claim 12, further comprising:

        a rear-facing warning light mounted on the rear of the vehicle; and  
        a connection between said electronic control means and said rear-facing warning light.

10              said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system.

15      19. A cooperative advance warning system according to claim 13, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

20      20. A cooperative advance warning system according to claim 18, wherein the vehicle brake lights remain flashing on and off only for a pre-determined period of time following activation of the advance warning system.

25      21. A cooperative advance warning system according to claim 18, wherein said rear-facing warning light remains flashing on and off only for a pre-determined period of time following activation of the advance warning system

22. A cooperative advance warning system according to claim 16, further comprising:

        a rear-facing warning light mounted on the rear of the vehicle; and

a connection between said electronic control means and said rear-facing warning light,

said electronic control means being capable of causing said rear-facing warning light to flash on and off at a high frequency upon activation of the advance warning system,

said switch having a first mode for activating and deactivating said lamp only, and a second mode for activating and deactivating both said lamp, and said rear-facing warning light.

23. A method of warning drivers of vehicles of an upcoming, unexpected road hazard comprising:

selecting a plurality of locations, each said location being located a selected respective distance from the road hazard;

locating at each said location a portable cooperative advance warning system comprising a lamp for emitting a light beam that is visible to the drivers of said vehicles; and

causing each of said lamps to flash on and off at a respective frequency that is in proportion to said selected respective distance of said lamp from the road hazard.

24. A method according to claim 18, wherein said respective frequency comprises a cadence.

25. A method according to claim 18, wherein said locations are positioned generally in the same direction from the road hazard.

26. A method according to claim 18, wherein the colour of light emitted by said lamp is selected from the group of colours consisting of fuchsia and pink.

27. A method according to claim 18, wherein said respective frequency is inversely proportional to said selected respective distance of said lamp from the road hazard.

## ABSTRACT

The present invention is a cooperative advance warning system for use in warning oncoming traffic of unexpected upcoming road hazards. The system comprises a lamp mounted on a vehicle so that light emitted by the lamp is visible to drivers of oncoming vehicles, a switch accessible to the driver for activating the lamp when the driver comes upon an unexpected road hazard, and an electronic control unit for controlling the characteristics of the light emitted from the lamp.

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1669-107	<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/CA99/00598	International filing date ( <i>day/month/year</i> ) 30/06/1999	Priority date ( <i>day/month/year</i> ) 30/06/1998	
International Patent Classification (IPC) or national classification and IPC G08G1/16			
Applicant ROWLEDGE, Darrel			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
  
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
 

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:

- I    ☒ Basis of the report

II    ☐ Priority

III    ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

IV    ☐ Lack of unity of invention

V    ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

VI    ☐ Certain documents cited

VII    ☒ Certain defects in the international application

VIII    ☐ Certain observations on the international application

Date of submission of the demand  25/01/2000	Date of completion of this report  10.08.2000
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized officer  Fritzsche, H+V  Telephone No. +49 89 2399 2394



A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G08G1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 237 306 A (ADELL ROBERT) 17 August 1993 (1993-08-17) column 6, line 6 - line 26; figures 1-8, 33-37	1, 10
A		2-9, 11-21
A	US 5 663 706 A (FRANCIS JOSEPH A) 2 September 1997 (1997-09-02) figures 1-3	16
P, X	WO 98 51535 A (POLLIN ROBERT E) 19 November 1998 (1998-11-19) page 6, line 1 - line 18	1, 10
P, X	US 5 914 651 A (SMALLS BRYAN H) 22 June 1999 (1999-06-22) the whole document	1, 10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

29 October 1999

Date of mailing of the international search report

05/11/1999

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 99/00598

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5237306 A	17-08-1993	NONE	
US 5663706 A	02-09-1997	NONE	
WO 9851535 A	19-11-1998	AU 3116797 A	08-12-1998
US 5914651 A	22-06-1999	NONE	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/CA99/00598

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1,5-11	as originally filed			
2-4,4a	as received on	21/07/2000	with letter of	21/07/2000

**Claims, No.:**

1-17	as received on	21/07/2000	with letter of	21/07/2000
------	----------------	------------	----------------	------------

**Drawings, sheets:**

1/6-6/6	as originally filed
---------	---------------------

2. The amendments have resulted in the cancellation of:

- |                                     |                  |         |       |
|-------------------------------------|------------------|---------|-------|
| <input type="checkbox"/>            | the description, | pages:  |       |
| <input checked="" type="checkbox"/> | the claims,      | Nos.:   | 18-21 |
| <input type="checkbox"/>            | the drawings,    | sheets: |       |

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/CA99/00598

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-17
	No:	Claims	
Inventive step (IS)	Yes:	Claims	3,8-11
	No:	Claims	1,2,4-7,12-17
Industrial applicability (IA)	Yes:	Claims	1-17
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**

Re Item V

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following document:

D1: US-A-5 237 306 (ADELL ROBERT) 17 August 1993 (1993-08-17)

1. The document D1 is regarded as being the closest prior art to the subject-matter of **claim 1**, and discloses (the references in parentheses applying to this document):  
A cooperative advance warning system (abstract) for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising:  
a lamp mounted on the vehicle (Fig.7: 90) in a location where light emitted by the lamp is visible to drivers of the oncoming vehicles;  
a switch means (61,81,abstract, col.6, lines 6-27) connected to the lamp for activating and deactivating the lamp, the switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and  
an electronic control means (78) connected to the lamp for controlling the characteristics of the light emitted by the lamp  
said electronic control means being capable of causing said lamp to flash on and off at a pre- determined frequency.
- 1.1 In consequence, the advance warning system claimed in claim 1 differs from the system known from document D1 in that  
said frequency being variable depending on the length of time said lamp has been activated.  
The problem to be solved by the present invention may therefore be regarded as creating a system which sufficiently alerts the driver of an oncoming vehicle.

The solution is however a simple feature. This feature might be a system which changes the flashing frequency between two frequencies. If two frequencies are used one after the other the present frequency is depending on the length of time. This changing of frequency clearly alerts oncoming drivers very well.  
Consequently, the skilled person would regard it a normal design procedure to

combine all the features set out in claim 1.

Thus, the subject-matter of **claim 1** does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT.

2. In this general version of claim 1 no information about the distance of the upcoming hazard can be given. Consequently, the problem as stated on page 2 cannot be solved with this feature.

It appears that the intention of the applicant was to claim a feature similar to the feature shown in the description on page 6, lines 19/20. This is an essential feature to solve the problem. If the claim were reformulated accordingly it would include an inventive step.

3. The features of **claim 2** are known from D1, column 6, lines 27-39 (40).

Thus, the subject-matter of claim 2 does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT.

4. The feature of **claim 3** is not known nor hinted from the documents of the search report. This feature can solve the problem and inform the oncoming driver about the distance to the road hazard.

The subject-matter of claim 3 therefore meets the requirements of articles 33(2) and 33(3) PCT.

5. If the term cadence (claim 4) were interpreted as being "the measure or beat of sound or movement", then this feature could not support an inventive step, since every flashing has a beat. Additionally, a complex flashing is shown in D1, Fig.32 (e.g. flashing "h").

The features of claim 5 are known from D1.

The in-use indicator of claim 6 is generally known. The features of claim 7 are generally known.

Thus, the subject-matter of claims 4 to 7 does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT.

6. **Claim 8** is very similar to claim 3 and consequently also meets the requirements of articles 33(2) and 33(3) PCT.

**Claims 9-11** contain modifications of the inventive idea embodied in claim 8 and also meet the requirements of Articles 33(2) and 33(3) PCT.

7. The other dependent claims contain only minor features known from document D1 or are well known to the man skilled in the art. The subject-matter of these claims is accordingly lacking inventive step contrary to Article 33(3), PCT.

**Re Item VII**

**Certain defects in the international application**

The features of the claim/s are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

or accepted, safe and reliable method or device to allow them to communicate an advance warning to approaching vehicles.

5 While flashing one's headlights could be interpreted as such a warning, it is cumbersome and generally not understood as a signal connoting impending danger. Plus, one would have to repeatedly flash the vehicle headlights for each oncoming vehicle or group of vehicles. In addition, such practice is not advisable at night since either human or mechanical failure to get the lights back on presents a significant danger in itself. An additional  
10 problem with head light flashing, is that the driver of the oncoming vehicle has no way of knowing the distance to the upcoming, unexpected road hazard. This may result in the driver relaxing and speeding up just before coming upon the hazard.

15 Similarly, four-way flashers, which flash signal lights at all four corners of the vehicle simultaneously, indicate that the flashing vehicle is, itself, the hazard. Turn signals indicate turns. Even hand signals are of little value.

20 In United States Patent No. 5,237,306, issued to Robert Adell on August 17, 1993, a signalling system is described for requesting a driver of a motor vehicle to dim or turn on his vehicle's headlights, but Adell provides no means for warning on-coming drivers of an upcoming road hazard, or for informing them of the relative location of that road hazard.  
25

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a cooperative advance warning system for road hazards that will enable drivers to warn oncoming traffic of unusual and unexpected hazards which obviates and mitigates from the disadvantages of the prior methods.

A further object of the present invention is to provide a cooperative advance warning system for road hazards which is easy and convenient to initiate and requires little effort or distraction of the driver and which delivers an advance warning to oncoming drivers that is clear, obvious, unmistakable and which will not be confused with any other signal.

It is a further object of a preferred embodiment of the present invention to provide a cooperative advance warning system for road hazards that can be used to warn oncoming drivers of upcoming, unexpected road hazards and indicate to them whether the hazard is relatively near or far.

According to the present invention, there is provided a cooperative advance warning system for use on a vehicle to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising: a lamp mounted on the vehicle in a location where light emitted by the lamp is visible to drivers of the oncoming vehicles; a switch means connected to the lamp for activating and deactivating the lamp, the switch means mounted to the vehicle in a location that is easily accessible to the driver of the vehicle; and an electronic control means connected to the lamp for controlling the characteristics of the light emitted by the lamp, the electronic control means being capable of causing the lamp to flash on and off at a pre-determined frequency, the

predetermined frequency being variable depending on the length of time the lamp has been activated

5 According to another aspect of the present invention, there is provided a portable cooperative advance warning system for use in warning drivers of oncoming vehicles of an upcoming, unexpected road hazard comprising: a housing; a lamp mounted to the housing; a switch means mounted on the housing and connected to the lamp for activating and deactivating the lamp; an electronic control means mounted to the housing and connected to the lamp for  
10 controlling the characteristics of the light emitted by the lamp, the electronic control means being capable of causing the lamp to flash on and off at a predetermined frequency, the predetermined frequency being variable depending on the distance from the road hazard; and a power supply for providing power to the system.

15 The present invention advantageously provides a cooperative advance warning system for road hazards which is inexpensive and easy to use. A further advantage is that it can be easily adapted to and installed on any vehicle, new or old. Another advantage is that the present system avoids  
20 confusing drivers of oncoming vehicles by providing a warning which is specific to an upcoming, unexpected road hazard. Yet another advantage is that the present system is easy and convenient to initiate, takes little effort and causes little distraction to the driver. Additionally, an important advantage of a preferred embodiment of the present invention is that it can indicate to  
25 drivers of oncoming vehicles whether the road hazard is near or far.

Other advantages, objects and features of the present invention will be readily apparent to those skilled in the art from a review of the following

detailed descriptions of a preferred embodiment in conjunction with the accompanying drawings and claims.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

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Preferred embodiments of the present invention will now be described in greater detail, and will be better understood when read in conjunction with the following drawings, in which:

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Figure 1, is a schematic representation of a typical application of the present invention to warn drivers of oncoming vehicles of an upcoming, unexpected road hazard.

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Figure 2, is a schematic, partially sectional, plan view of the front portion of a vehicle on which the present invention has been installed.